

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (withdrawn): A pulse laser system composed of a plurality of replaceable modules,
comprising;
an ultrafast oscillator module;
a nonlinear amplifier module receiving the oscillator output and amplifying the signal while broadening its spectral width;
an isolator module for eliminating feedback into the oscillator;
a stretcher module for temporally stretching the output of said isolator/polarizer oscillator;
a linear pre-amplifier module for amplifying the stretched output;
a down-counter module for controlling the repetition rate of the laser system;
a power amplifier module for amplifying the output of the down-counter module; and
a compressor for temporally shortening the output of said power amplifier module.
2. (currently amended): A pulse laser system composed of a plurality of replaceable modules, comprising;
an ultrafast oscillator module;
a stretcher module for temporally stretching the output of said oscillator module;
a spectral filter module placed before or after said stretcher module and external to said oscillator module, said spectral filter module optically connected to said ultrafast oscillator

module and comprising at least one spectral filter having a wavelength sensitive characteristic that modifies a spectral shape of an output from said ultrafast oscillator, including a spectral width of said output ;

at least one pre-amplifier module downstream of said spectral filter module;
a down-counter module for reducing the repetition rate of the laser system;
a power amplifier module for amplifying the output of the down-counter module; and
a compressor for temporally shortening the output of said power amplifier module.

3. (withdrawn): A system as claimed in claim 2, wherein said source is an ultrafast oscillator, and further including isolator means for isolating said oscillator from a first of said amplifier stages to a level of at least 35dB.

4. (currently amended): A pulse laser system, comprising the following components:

a signal source;
a stretcher temporally stretching an output of said source;
a fiber amplifier; and
a compressor recompressing an output of said amplifier; and
an AOM selecting output pulses from said amplifier;

wherein each of said components comprise ~~is provided as~~ a pre-tested module, and said system is configured with ~~constructed by individually connecting~~ at least said signal source, said stretcher, said fiber amplifier and said AOM optically connected into the system ~~via simple fiber splices[,];~~

at least one tap unit within or between ones of said modules, including means for picking off a portion of said signal for enabling measurement of a spectrum within or between said modules, and

at least one spectral filter, said at least one spectral filter being disposed external to said signal source and said fiber amplifier, and either before or after said stretcher, said filter having a wavelength sensitive characteristic that modifies a spectral shape of an output from said signal source and narrowing narrows the spectrum of the signal source output;

wherein at least one of said tap units is located downstream of said filter and configured to enable measurement of said narrowed spectrum.

5. (withdrawn): A system as claimed in claim 1, wherein ASE is spectrally separated from the signal by one or more of said compressor and at least one of said amplifiers.
6. (withdrawn): A system as claimed in claim 1 or 2, wherein an attenuator module which attenuates the oscillator output is located between said oscillator and said non-linear amplifier; and PM-PM splices are used to join said modules.
7. (original): A system as claimed in claim 2, further including tap modules between one or more selected ones of said modules.
8. (original): A system as claimed in claim 2, further including polarization modules located between selected ones of said modules.
9. (original): A system as claimed in claim 2, wherein said down-counter module comprises an AOM, and additionally serves as a bandwidth filter.

10. (withdrawn): A system as claimed in claim 1, further including a spectral filter between said oscillator module and said nonlinear amplifier.
11. (withdrawn): A system as claimed in claim 1, wherein said preamplifier has a gain bandwidth narrower than the spectrum from the non-linear amplifier, to spectrally filter the output from said non-linear amplifier, said non-linear amplifier shifting ASE to shorter wavelengths away from the signal.
12. (original): A system as claimed in claim 2, wherein said power amplifier includes a diode-based pump, and serves as a spectral filter.
13. (original): A system as claimed in claim 2, wherein said oscillator produces a relatively broad spectrum output above approximately the 10nm range, and wherein an attenuator module attenuates the oscillator output.
14. (original): A system as claimed in claim 2, wherein the pulse signal output from said compressor is in the fs regime.
15. (withdrawn): An all-fiber chirped pulse amplifier system composed of a plurality of modular optical subassemblies, comprising;
- at least an oscillator module, a stretcher module, and an amplifier module, each subject to separate assembly and test, at least said oscillator module, said stretcher module and said amplifier module being coupled into the system by a fiber splice;
- means located between respective ones of said modules for connecting test equipment for monitoring at least one of spectrum and pulse quality at each location, at least to identify uncompressible pulse components, the number of said means for connecting test equipment is at least one, but less than the number of said modular subassemblies and

means located between respective ones of said modules for improving fidelity of the polarization state, where the number of said means for improving fidelity of the polarization state is at least one, but less than the number of said modular subassemblies.

16. (withdrawn): A pulse laser system, comprising;

a signal source;

a stretcher for temporally stretching an output of said source;

a fiber amplifier; and

a compressor for recompressing an output of said amplifier; and

an AOM unit combining the functions of pulse selection and bandwidth filter, said AOM unit comprising an AOM, lenses, and a fiber receiving the output from the AOM and said lenses.

17. (withdrawn): A pulse laser system, comprising;

a signal source;

a stretcher for temporally stretching an output of said source;

at least one fiber amplifier stage; and

a compressor for recompressing an output of a final amplifier stage; and

wherein a length of one of said amplifier stages is selected to remove ASE at the lasing wavelength, and said compressor serving as a spectral filter.

18. (withdrawn): A system as claimed in claim 17, further including an AOM for selecting output pulses from one of said amplifier stages.

19. (withdrawn): A system as claimed in claim 17, wherein said signal source is an ultrafast oscillator, and further including filter means for spectral matching between said oscillator and a first of said amplifier stages.

20. (withdrawn): A system as claimed in claim 17, wherein said signal source is an ultrafast oscillator, and further including isolator means for isolating said oscillator from a first of said amplifier stages to a level of at least 35dB.

21. (withdrawn): A chirped-pulse amplification system, comprising;

a signal source;

a stretcher module;

at least one amplifier stage, including a non-linear amplifier module and a linear amplifier module;

a compressor module; and

wherein said non-linear amplifier broadens the spectrum of the signal by at least a factor of 2 by self-phase modulation, and said linear amplifier serves as a spectral filter by a mechanism including at least gain narrowing.

22. (withdrawn): A system as claimed in claim 21, wherein said compressor module further operates as a spectral filter.

23. (withdrawn): A chirped-pulse amplification system, comprising;

an ultrafast oscillator signal source;

at least one amplifier stage;

a compressor module;

at least one isolator module between said oscillator and a first of said amplifier stages providing at least 35dB isolation therebetween; and
a spectral filter within said isolator module, narrowing a spectrum of a signal output from said oscillator.

24. (withdrawn): A chirped-pulse amplification system, comprising;

an ultrafast oscillator module;

a spectral filter narrowing a spectrum of a signal output from said oscillator;

at least one amplifier module;

a down-counter module;

a compressor module; and

means between ones of said modules for improving fidelity of the polarization state.

25. (withdrawn): A system as claimed in claim 17, where said length is approximately 4m.

26. (withdrawn): An active stabilization system for a fiber amplification system, comprising:

a power amplifier including a gain fiber,

a pump source for said power amplifier,

means for directing a portion of the pump light from said pump source into a monitor fiber identical to or equivalent to said gain fiber, so as to clone a temperature dependent spectrum of said gain fiber; and

feedback means for controlling a parameter of said pump source so as to match the pump source wavelength with an absorption spectrum of the gain fiber.

27. (withdrawn): A system as claimed in claim 26, wherein said directing means comprises a tap unit.
28. (withdrawn): A system as claimed in claim 26, wherein said directing means includes means for collecting scattered or spurious pump light from said pump source.
29. (withdrawn): A system as claimed in claim 26, wherein said controlled parameter is a temperature of said pump source.
30. (withdrawn): A system as claimed in claim 26, wherein said monitor fiber is said gain fiber.
31. (withdrawn): A system as claimed in claim 26, wherein said gain fiber and said monitor fiber are in substantially or fully in thermal contact with one another.
32. (withdrawn): A system as claimed in claim 26, wherein said power amplifier is side-pumped.
33. (withdrawn): A chirped-pulse amplification system, comprising;
a signal source;
at least one amplifier module;
a compressor module; and
an AOM module located within said amplification system and operating as a pulse deflector, said deflector introducing spatial dispersion; and
said compressor module comprising a bulk grating compressor compensating for said spatial dispersion.

34. (withdrawn): A system as claimed in claim 33, wherein said AOM deflector serves as one stage of said compressor.
35. (original): A system as claimed in claim 24, wherein said means between selected ones of said modules comprises a polarizer module which contains at least a polarizer unit tunable to reject light propagating in an unwanted polarization state.
36. (original): A system as claimed in claim 35, wherein one or more of said polarizer modules contain one or more isolator units.
37. (withdrawn): The chirped pulse amplifier system of claim 15 wherein said compressor module compresses at least one of a bulk-grating compressor, a diffraction grating generated with an acousto-optic device, and a Periodically-Poled Lithium Niobate (PPLN) element.
38. (withdrawn): The chirped pulse amplifier system of claim 15 wherein said at least one means for improving the fidelity of the polarization state comprises a module having a combination of an attenuator and a tap point.
39. (withdrawn): An all-fiber chirped pulse amplifier system composed of a plurality of modular optical subassemblies, comprising;
- at least an oscillator module, a stretcher module, amplifier module, and a compressor module, each module subject to separate assembly and test, wherein one or more of said oscillator, stretcher, and amplifier modules comprise at least one of a polarization maintaining fiber amplifier and a length of an undoped polarization maintaining fiber;

means located between respective ones of said modules, for connection to test equipment for monitoring a signal representative of a pulse characteristic at each location, at least to identify uncompressible pulse components, and

at least one means between ones of said modules for improving fidelity of the polarization state.

40. (withdrawn): The all-fiber chirped pulse amplifier system of claim 39 wherein a plurality of said modules are coupled to one another by a polarization maintaining fiber splice.

41. (new): The pulse laser system as claimed in claim 4, wherein said filter is disposed before said stretcher, and said system comprises an attenuator module disposed between said signal source and said stretcher, said attenuator controlling an amplitude of pulses emitted from said source so as to prevent non-linear effects within said stretcher from altering a pulse spectrum.

42. (new): The pulse laser system as claimed in claim 41, wherein said filter is packaged within a filter-attenuator (F1/Attn) module.